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Applicant : King Jien Chui
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Remarks/Arguments

Examiner Ms. Joannie Garcia is thanked for the thorough Office Action.

In the Claims

Parent claim 1 has been amended: to add – at least a portion of – before “the doped depletion” at line 10 of claim 1; and to add – directly – before “beneath” at line 11 of claim 1. No new matter has been entered. For support, please see Fig. 3A, for example. Applicants urge that the addition of “at least a portion of” broadens claim 1. Applicants urge that the addition of “directly” simply makes explicit what was implicit in view of the specification and drawings as filed and does not narrow claim 1.

Parent claim 1 has been amended to add – and – after subparagraph b). This amendment corrects an inadvertent editorial error and is not believed to narrow the scope of claim 1.

Claim 2 is amended. For support see fig 3A. See Spec. p. 14.

Claim 4 has been amended to replace “region” with – regions – as requested by the Examiner to overcome the Objection to claim 4. This amendment is not believed to narrow the scope of claim 4.

Claim 7 has been amended to: delete the slash (/) between the words “source” and “drain” and replace it with the word – and – at line 2 of claim 7 for clarity. These amendments are not believed to narrow the scope of claim 7.

Claim 9 is amended to add “the doped depletion regions are directly beneath and separated from said LDD regions.”. for support see Figure 2A and 2B.

Claim 21 has further been amended by replacing “implant” with

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1 -- implantation -- as requested by the Examiner to overcome the objection to
2 claim 21. This amendment is not believed to narrow the scope of claim 21.

3 Parent claim 23 has been amended in the manner requested by
4 the Examiner to overcome the objections to claim 23. Further: the slash (/) has
5 been removed between the words "source" and "drain" and replace with -- and --
6 at line 7 of claim 23 for clarity; and the word -- and -- has been added before step
7 c) as an editorial amendment. These amendments are not believed to narrow the
8 scope of claim 23.

9 Claim 25 has been amended to: delete the slash (/) between the
10 words "source" and "drain" and replace with -- and -- at line 2 of claim 25 for
11 clarity; and add -- about -- after "between" at each instance. These amendments
12 are not believed to narrow the scope of claim 25.

13 Claim 38 has been amended to add -- and -- after line 3. This
14 amendment is not believed to narrow the scope of claim 38.

15 **New claims**

16 Claims 41 to 43 are new and have been added to better
17 encompass the full scope and breadth of the invention notwithstanding the
18 patentability of the original claims.

19 Claim 41 depends from independent claim 1.

20 Claim 42 depends from independent claim 23.

21 Claim 43 is an independent claim and comprises the limitations
22 of independent claim 1 and allowable claim 9 (thus claim 43 is now allowable).

23
24 No new matter has been added in any of the above claim
25 amendments and in no case do these amendments narrow the scope of the
26 respective claims and they do not invoke FESTO related amendments.

27
28 **Objection to the claims for Informalities**

29 The claims are amended to correct the informalities kindly point
30 out the examiner.

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CLAIM REJECTIONS:

Rejection Of Claims 1, 2, 7, 8 and 14 Under 35 U.S.C. § 102(b) as being anticipated by Burr (US Patent Publication 2003/0178698 A1)

The rejection of claims 1, 2, 7, 8 and 14 under 35 U.S.C. § 102(b) as being anticipated by Burr (US Patent Publication 2003/0178698 A1) (the '698 Burr Publication) is acknowledged. Reconsideration and withdraw is respectfully requested in view of the amendments.

Applicant urges that amended Parent claim 1 is allowable for the following reasons.

Parent Claim 1 is allowable

Amended Claim 1 is not anticipated *nor obvious* in view of Burr because Burr does not disclose or fairly teach claim 1's limitations of, inter alia:

at least a portion of the doped depletion regions are directly beneath and separated from said source and drain regions;

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1 Parent claim 1 states:

1. (CURRENTLY AMENDED) A method of forming a semiconductor device comprising:

- a) forming a gate structure over a substrate being doped with a first conductivity type impurity;
- b) performing a doped depletion region implantation by implanting ions being a second conductive type into the substrate to form doped depletion regions; and
- c) performing a S/D implantation by implanting ions being the second conductivity type into the substrate to form source and drain regions adjacent to said gate structure; **at least a portion of the doped depletion regions are directly beneath and separated from said source and drain regions;**
 - (1) said doped depletion regions having an impurity concentration and thickness so that said doped depletion regions are depleted due to a built-in potential created between said doped depletion regions and said substrate;
 - said doped depletion regions having an impurity concentration so that a built-in junction potential between said doped depletion regions and said substrate forms depletion regions in the substrate between the source and drain regions and the doped depletion regions;
 - said depletion regions have a net impurity concentration of the first conductivity type.

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Applicants repeat their previous relevant arguments as to the '698 Burr Patent Publication as to amended claim 1 and further, Parent claim 1 includes the limitation, inter alia, "**at least a portion of the doped depletion regions are directly beneath and separated from said source and drain regions;**". This limitation is not shown or fairly described in Burr as evidenced by Table A showing Applicant's figure 3A and Burr's figure 7A:

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1 Table A

[illegible]

Thus Fig. 3A shows that at least a portion of the doped depletion regions 130 are directly beneath and separated from said source region 150 and said drain region 150. In contrast, Burr figure 7A shows that **no portion of** perforated Buried N-well (N+) 770 is **directly beneath both the source and drain regions 703 and 705**. Burr figure 7A clearly shows there is **no perforated Buried N-well (N+) 770 beneath the source/drain region 703**. In fact, in Figure 7A, Burr teaches away from this limitation by showing only the substrate (not buried N+ well 770) beneath the source/drain 703. See Figure 7A; See Burr para 164. A Key to Burr's invention is the opening below the S/D that provide a longer resistance page. See Burr Abstract, col. para 164.

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1 The instant office action posits the follow:
2 performing a doped depletion implantation region by implanting ions being a
3 second conductivity type to the substrate to form doped depletion regions 770
4 beneath and separated from source/drain regions 703 705 (Figure 7 A and
5 Paragraphs 0161, and 0164),
6

7 However, as shown above in amended claim 1 and table A, Burr
8 (Figure 7 A and Paragraphs 0161, and 0164) do not teach applicant's claimed
9 doped depletion regions 130 are directly beneath and separated from said
10 source region 150 and said drain region 150. Moreover, Burr teaches a different
11 method to form the buried N+ well 770. As noted above there is no motivation to
12 change Burr since a key to Burr's invention is the opening below the S/D that
13 provide a longer resistance page. See Burr Abstract, col. para 164. Furthermore
14 there is no motivation to modify Burr to meet applicant's claim 1 since Burr solves
15 a different problem than the invention.

16
17 Therefore claim 1 is allowable.
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19 **Amended Claim 2 is non-obvious**

20 Amended claim 2 states:

2. (CURRENTLY AMENDED) The method of claim 1 wherein said doped depletion regions are not formed directly under said gate structure.

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22 As discussed above, Burr teaches against this limitation. In
23 contrast to claim 2, Burr fig. 7A forms buried N+ well 770 directly under the gate.
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25 Claims 2, 7, 8 and 14 depend from claim 1 and therefore they
26 are also allowable.

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Rejection of claims 12, 13, 15, 18 to 21 and 23 to 25 under 35 U.S.C. § 103(a) as being unpatentable over Burr (US Patent Publication 2003/0178698 A1) as applied to claims 1, 2, 7, 8 and 14 above and further in view of Bae et al. al (US Patent Publication 2004/0075143 A1).

The rejection of claims 12, 13, 15, 18 to 21 and 23 to 25 under 35 U.S.C. § 103(a) as being unpatentable over Burr (US Patent Publication 2003/0178698 A1) (the '698 Burr Publication) as applied to claims 1, 2, 7, 8 and 14 above and further in view of Bae et al. al (US Patent Publication 2004/0075143 A1) (the '143 Bae Publication) is acknowledged. Reconsideration and withdrawal of the rejection is respectfully requested in view of the amendments.

Claims 12 13 15 and 18 to 21 depend from amended parent claim 1

Claims 12 13 15 and 18 to 21 depend from amended parent claim 1 are should be allowable for the reasons discussed above under the 102(b) rejection of claims 1, 2, 7, 8 and 14.

This amendment is not a concession that the previous versions of claims are not allowable. This amendment made to accelerate the allowance of claims. Applicant still maintains that previous claim 1 and it's depend claims are allowable for the reasons stated in the previous responses to office actions.

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1 **Parent Claim 23 is allowable**

2 Parent claim 23 states:

23. (CURRENTLY AMENDED) A method of forming a semiconductor device comprising:

- a) forming a gate structure over a substrate being doped with a first conductivity type impurity;
- b) performing a doped depletion region implantation by implanting ions being a second conductivity type to the substrate to form doped depletion regions beneath and separated from said source[/] and drain regions;
 - (1) said doped depletion regions have an impurity concentration and thickness so that said doped depletion regions are depleted due to a built-in potential created between said doped depletion regions and said substrate; and
- c) performing a S/D implantation by implanting ions being the second conductivity type into the substrate to form said source and drain regions adjacent to said gate structure;
 - (1) said substrate between said source and drain regions and said doped depletion regions has a concentration of a first type impurity between 1E16 to 1E18 atom/cc;
said doped depletion regions have an impurity concentration so that the built-in potential between said doped depletion regions and said substrate forms depletion regions in the substrate between the source and drain regions and the doped depletion region regions; said depletion regions have a net impurity concentration of the first conductivity type; said depletion regions have a net impurity concentration between 1E16 to 1E18 atom/cc.

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6 Parent claim 23 contains at least the subject matter limitations
7 of claim 1 (without the addition of – at least a portion of – and – directly – added
8 in the instant Response) **and the limitations of allowable claim 4 (bolded**
9 **above).**

9

10 Therefore claim 23 is allowable.

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Dependent Claims 24 to 27 are allowable

Dependent claims 24 to 27 depend from claim 23 which, by the Examiner's statement of allowability of dependent claim 4 and Applicants' arguments above, is allowable and hence claims 24 to 27 are allowable.

Dependent Claim 24 is (further) allowable

Dependent Claim 24 is (further) allowable because it includes the limitation "wherein said doped depletion regions are not formed under said gate structure." See Table A above which clearly demonstrates that Burr lacks this limitation and the '143 Bae Patent Publication does not cure this shortcoming under 103(a). Also, because of the reasons given in the previous office action.

Thus claims 12, 13, 15, 18 to 21 and 23 to 25 are patentably distinguishable under 35 U.S.C. § 103(a) over Burr as applied to claims 1, 2, 7, 8 and 14 above, and further in view of Bae for the above reasoning/arguments and further because, inter alia: the prior art lack a suggestion that the reference should be modified in a manner required to meet the claims; Burr is a poor reference; the Examiner misunderstood Burr; the invention is contrary to the teaching of the prior art—that is, the invention goes against the grain of what the prior art teaches; the Examiner has made a strained interpretation of the reference that could be made only by hindsight; the Examiner has not presented a convincing line of reasoning as to why the claimed subject matter as a whole, including its differences over the prior art, would have been obvious; and the reference takes a difference approach.

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The combination of Burr and Bae is improper

Yet further, the combination of Burr and Bae is improper for the following reasons. Burr and Bae are unrelated, solve different problems, use different solutions and have no process steps in common. The combination is Unsuggested: The prior art references do not contain any suggestions (express or implied) that they be combined, or that they be combined in the manner suggested. The references are individually Complete: Each reference is complete and functional in itself, so there would be no reason to use parts from or add or substitute parts to any reference. Therefore combination is improper.

Even if combined, the references do not meet or suggest the applicant's claims.

The dependent claims depend from non-obvious parent claims and are therefore non-obvious. As described above, the parent claims are non-obvious over the references.

NEW CLAIMS

New claim 41 is non-obvious.

Claim 41 states:

41. (NEW) The method of claim 1, further comprising a channel region in said substrate under said gate structure; wherein said heavily doped depletion regions are not directly beneath said channel region.

As discussed above, Burr teaches against claim 41.

Claim 42 is non-obvious

Claim 42 depends from independent claim 23.

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42. (NEW) The method of claim 23, wherein at least a portion of the doped depletion regions are directly beneath and separated from said source and drain regions.

Burr teaches against having depletion regions under both the source and drain. See Burr fig. 7A.

Claim 43 is allowable

Claim 43 is an independent claim and comprises the limitations of independent claim 1 and allowable claim 9 (thus claim 43 is now allowable).

ALLOWABLE SUBJECT MATTER

The allowance of claims 38 to 40 is gratefully acknowledged.

The objection to claims 4* to 6, 9 to 11, 16, 17, 22, 26, 27 and 37 as being dependent upon a rejected base claims, but allowable if rewritten in independent form is gratefully acknowledged. [*Please see the argument above for the allowability of independent claim 23 as it now includes, inter alia, the limitations of claim 1 and claim 4.]

Applicant requests that the rewriting of objected to claims 4, 9 to 11, 16, 17 and 22 be held in abeyance pending the final determination of the allowability of their parent claim 1. Applicant requests that the rewriting of objected to claims 26 and 37 be held in abeyance pending the final determination of the allowability of their parent claim 23.

CONCLUSION

It is believed that all the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does

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not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper. and the amendment of any claim does not necessarily signify concession of the unpatentability of the claim prior to its amendment.

In conclusion, reconsideration and withdrawal of the rejections are respectfully requested. Allowance of all claims is requested. Issuance of the application is requested.

It is requested that the Examiner telephone the undersigned attorney at (215) 670-2455 should there be anyway that we could help to place this Application in condition for Allowance.

Charge to Deposit Account

The Commissioner is hereby authorized to apply any fees or credits in this case, which are not already covered by check or credit card, to Deposit Account No. 502018 referencing this attorney docket. The Commissioner is also authorized to charge any additional fee under 37 CFR §1.16 and 1.17 to this Deposit Account.

Respectfully submitted,

William J. Stoffel REG # 39,390/

William J. Stoffel date: 28 June 2006
Customer No. 30402
Stoffel Law Office
1735 Market St - Ste A455
Philadelphia, PA 19103-7502 USA
Telephone: 215-670-2455
Fax: 267-200-0730

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